Technical Memorandum

Date: October 20, 2021

Re: CBP Water Supply Investment Program Water Exchange Operations Analysis
Chino Basin Program
Chino Hills, CA
GEI Project No. 1805179

Introduction

The objective of this memorandum is to provide an overview of the Chino Basin Program Water Supply Investment Program Water Exchange Operations Model. (CBP WSIP Ops Model) and present findings developed though application of the model to support the feasibility analysis of the Chino Basin Program. Inland Empire Utilities Agency (IEUA) and local partners have long-term plans to implement a variety of new infrastructure to meet future needs for wastewater treatment and potable water supplies, while increasing resiliency and sustainability of regional water resources management. The Chino Basin Program (CBP) provides an opportunity to implement critical long-term project components of these plans, addressing local, regional, and potentially statewide and federal water resources management issues. A unique feature of the CBP is a proposed water exchange that would allow the CBP to make up to 40 thousand acre-feet per year (TAFY) of advanced purified water available to Metropolitan Water District of Southern California (Metropolitan) in hydrologically drier years in place of the same amount of supply delivered by the State Water Project (SWP). In return, 40 TAFY that would otherwise have been exported to Metropolitan would be stored in Lake Oroville and used together with Delta carriage water savings to enhance instream flows in the Feather River.

The proposed CBP WSIP water exchange involves some reoperation of SWP facilities. Water released from Lake Oroville to support pulse flows in the spring would be replaced by reducing exports to Metropolitan over the remainder of the calendar year. A foundational premise of this water exchange proposal is that other SWP objectives should not be impacted by these reoperations. The CBP WSIP Ops Model was developed to provide proof of concept that with appropriate protocols to reduce risk, the required reoperations could be implemented without impacting other SWP objectives.

CBP WSIP Ops Model Overview

The CBP WSIP Ops Model was developed and refined over the past several years to help demonstrate proof of concept for the proposed CBP WSIP water exchange, aid in developing protocols to reduce risk to other SWP objectives, and inform more in-depth consideration of potential operating rules and procedures by the California Department of Water Resources (DWR) and project participants. Conservative logic and assumptions are applied, with the understanding that real-time operational decisions would likely have more situational and forecast data input and ability to manage around potential issues. This operations model relies on CalSim model output to serve as a baseline for post-processing proposed project operations, using an Excel workbook model, “CBP WSIP Operations Analysis Tool v 20211001.xlsx.” Because of this dependency, limitations inherent to the CalSim model are also inherent to the CBP WSIP Ops Model. The model also provides capability to simulate potential groundwater banking operations for CBP water supplies, as well as supplemental

imported water supply banking operations that could add value to investment in CBP groundwater extraction facilities.

The Excel workbook that constitutes the model consists of several tabs, including:

- The "Operations Analysis" tab, which contains the primary CalSim post-processing logic, based on monthly timesteps consistent with CalSim output. The post-processing logic is documented in the "Ops Logic Documentation" tab.

- General inputs for the model are entered in the "General Inputs" tab. Explanatory notes are provided for each general input in that tab.

- Some inputs, specific to various CBP Take alternatives, are entered in the "Take Alt Assumptions" tab. Take alternatives vary by their physical capacity and intended operations, including projected annual amounts of In Lieu Exchange, Pump-In to Metropolitan Exchange, and Predelivery options. Explanatory notes are provided for these inputs in that tab.

- The "Exchange Bank Alts" tab includes supplemental banking assumptions for each designated Take alternative. This tab creates unique names for combinations of Take and Supplemental Banking assumptions that are used in the "Operations Output" tab to select comprehensive assumptions as described below.

- The "Operations Output" tab summarizes key output for any selected set of General Assumptions for the designated Take Alternative, including Banking Assumptions, selected in Cell B6. Multiple Take alternatives can be evaluated with the same General Assumptions in one calculation process using the what-if data table included in this tab.

- Other tabs provide relevant baseline CalSim output data and historical SWP operations data used as input, as well as graphical output of model results.

The general logic for the WSIP exchange and banking operations include the following steps:

1. New Advanced Water Purification Facilities (AWPF) provide monthly recharge to the Chino Basin and are added to a Chino Basin Storage Account. The Chino Basin Storage account has a maximum storage capacity as well as a maximum borrowing capacity. Any AWPF recharge water produced that cannot be used immediately for WSIP Exchange purposes or Banking Recharge and is beyond the maximum storage capacity is accounted for as Excess Chino Basin AWT Production and is not available for future CBP purposes.

2. When Chino Basin extraction capacity is available, Chino Basin Storage account supplies are moved to Auxiliary Local Storage (if that option is implemented in the general inputs), up to a maximum amount.

3. Pulse flow releases from Oroville take place in March, April, or May, depending on the selected month, availability of water or borrowing capacity in the Chino Basin Account, frequency limitations on pulse flows in immediately previous years, and storage conditions in Lake Oroville and San Luis Reservoir. Pulse flows are triggered by either SWP Table A allocation or Year Type. If SWP Table A allocation is chosen as the pulse flow trigger type, the trigger is activated if the SWP allocation in the selected month of the year of the pulse

flow must fall between an input minimum and maximum. If the Year Type trigger is chosen as the pulse flow trigger, pulse flows are activated by default in dry or critically dry years as measured by the Sacramento Valley Index, but other inputs can restrict pulse flows in critical years, allow pulse flows in below normal years, or force pulse flows in below normal years or any year if the Chino Basin Storage Account is nearing capacity. In months when pulse flows occur, the Oroville storage account is debited by the pulse flow volume.

4. An important update to this operations model was made in 2021 to provide logic capability to "Decouple" the SWP to Metropolitan reduction step of the WSIP exchange from the Chino Basin to Metropolitan replacement step of the WSIP Exchange. This option was added as discussions with Metropolitan progressed and that agency expressed a willingness to support the CBP by "Backstopping" the WSIP exchange. This means that instead of a month-by-month exchange of Chino Basin supplies for SWP supplies, Metropolitan would accept reductions in SWP deliveries during pulse flow call years on an annual basis without requiring real-time replacement from the Chino Basin. Applying this principle allows for different schedules for each step of the exchange and creates potential for additional conjunctive use storage in the Chino Basin on behalf of Metropolitan. Under this approach, as implemented in this operations model, deliveries from the Chino Basin to Metropolitan are triggered based on SWP Table A allocation or year type and added to an account. As pulse flow call years occur and SWP deliveries are reduced to Metropolitan, this account is debited. Trial and error is used to balance the triggers for pulse flow call years and deliveries from the Chino Basin to Metropolitan to maintain a reasonable-sized account over time in terms of debit or surplus deliveries.

5. If the Decouple option is selected, SWP deliveries to Metropolitan are reduced proportionally over the remainder of the calendar year of a pulse flow. If the Decouple option is not selected, SWP deliveries to Metropolitan are reduced as Chino Basin deliveries to Metropolitan occur, beginning in any month a pulse flow is triggered (if the Oroville storage account is not zero). If the option is selected, Pump-In deliveries to Metropolitan are limited to the amount of SWP delivery to Metropolitan, with options for points of delivery (East Branch of the California Aqueduct deliveries or East and West Branch of the California Aqueduct deliveries) and types of deliveries (Table A deliveries or Total SWP deliveries). Under either option, monthly SWP delivery reductions to Metropolitan results in reduced releases from San Luis Reservoir and increased storage relative to baseline operations, as accounted for in a San Luis Reservoir Account.

6. In the months of July, August, and September of each year, any Oroville Storage Account balance is repaid by reducing Oroville releases and Banks SWP exports at a rate equal to the monthly minimum of 1) Base Case excess Oroville releases and 2) Base Case Banks SWP exports above minimum. A minimum SWP export rate is provided as an input, and it is assumed pumping cannot be reduced beyond that amount for Human Health and Safety. Monthly repayments are added back to the Oroville Storage Account and subtracted from the San Luis Reservoir Account. If the entire Oroville Storage Account balance is not repaid after September, the balance carries over to the following year and exchanges continue to repay the San Luis Reservoir Account in full. This is a critical step in the reoperations and is a primary limiting factor in determining years that pulse flows can be implemented without impacting other SWP objectives. In years when total Orville releases and baseline exports in July, August, and September are less than the pulse flow volume, Oroville storage cannot be recovered by the end of the calendar year. It should be noted, however, that under this approach, even if Oroville storage is not fully recovered by the end of the year, the remining

exchange volume is stored in San Luis Reservoir south of the Delta as a result of delivery reductions to Metropolitan.

7. If the option for predelivery of water to Oroville is used, and if in any July, August, or September, the previous month's Oroville storage does not exceed the maximum amount setting, any additional amount of the monthly minimum of 1) Base Case excess Oroville releases and 2) Base Case Banks SWP exports above minimum and beyond the amount needed to repay an outstanding Oroville Storage Account Balance, is used to exchange water from San Luis to Oroville by reducing Banks SWP exports up to the amount set as the Maximum Predelivery to Oroville Storage input. The predelivered Oroville storage is then tracked in the Oroville Predelivery Cumulative Storage Account. The deficit created in San Luis is immediately begun to be repaid by exchange supplies provided 1) From the Chino Basin Storage Account to IEUA to offset reduced Metropolitan deliveries, 2) From Auxiliary Local Storage to other local agencies to offset reduced Metropolitan deliveries, and 3) From the Chino Basin directly to Metropolitan, as above, until eliminated. Predelivered Oroville water is used first when Feather River pulse flows are triggered, before debiting the San Luis Storage Account. If in any future month after predelivered water is stored in Oroville the baseline Oroville storage fills to maximum capacity (3,538 TAF), the predelivered water is spilled and deducted from the Oroville Predelivery Cumulative Storage Account. Evaluation of this predelivery to Oroville revealed that predelivered exchange water was at high risk of spill from Oroville before it could be used for pulse flow purposes and this approach is not currently under consideration.

8. If San Luis Reservoir is at dead pool during July through September resulting in an inability to pay back the Oroville storage account by October, deliveries to Metropolitan are deferred and accounting for as SWP/MWDSC Residual Reoperation. This residual amount is repaid through deliveries from San Luis Reservoir in future months until eliminated.

Analysis of CBP WSIP Water Exchange Operations

Assumptions

To demonstrate the feasibility of the WSIP exchange, the assumptions regarding CBP Take facilities and exchange operations included in the CBP Feasibility Study, October 2021, were applied using the CBP WSIP Ops Model. Key assumptions include:

- Call year pulse flow volume of 50 TAFY with 20 percent originating from SWP export carriage water savings, resulting in a 40 TAFY call year exchange requirement

- Pulse flows to be provided in April of call years, triggered by hydrological year type
    - Pulse flows restricted in critically dry years (this assumption is included due to DWR's preliminary analysis that exchanges under these conditions pose risk to other SWP objectives)
    - Pulse flows allowed in below normal years

- Maximum frequency of pulse flows set to three consecutive or four of 10 years

- Minimum Oroville storage to allow pulse flow and exchange set to 1,500 TAF

- Minimum Banks Pumping for San Luis to Oroville exchange set to 750 cfs

- Maximum Chino Basin groundwater extraction capacity dedicated to WSIP exchange of 40 TAFY
- 30 TAFY IEUA In Lieu Metropolitan exchange deliveries in call years
- 10 TAFY Pump-In to Metropolitan exchange deliveries in call years
- Maximum storage in Chino Basin Account set to 150 TAF with maximum borrowing of 100 TAF
- Metropolitan to SWP performance is Decoupled (Delinked) from Chino Basin to Metropolitan performance, as described above
- Chino Basin to Metropolitan performance triggered by SWP Table A allocation with maximum allocation of 42 percent
- Target Time Period for Completion of SWP Delivery Reductions to Metropolitan set at end of calendar year of pulse flow
- No supplemental groundwater banking operations are included in the analysis
- Baseline CalSim dataset is an updated CalSim output file that was provided by DWR that includes current Bay-Delta requirements.

The complete set of general inputs to the CBP WSIP Ops Model is delineated in Table 1.

Results

The output results of this operations analysis indicate that the proposed CBP WSIP exchange operations are possible with reasonable frequency and without significant risk of impact to other SWP objectives. Summary output from the model is displayed in Table 2. Over the 81 years of CBP WSIP Ops Model simulated operations (as limited by CalSim output), a total of 23 pulse flows of 50 TAF were executed, or 28 percent of all years. This is consistent with the CBP objective of 7.5 pulse flows over a 25-year WSIP term, or pulse flows in 30 percent of years. Additional pulse flows would be possible under the general conditions modeled if pulse flows were allowed in some critically dry years, when SWP storage conditions would mitigate any significant impacts to the SWP.

Of the modeled 23 pulse flows, 13 occurred in dry years and ten occurred in below normal years. Lake Oroville storage was not fully recovered in four of the pulse flow years, with an average storage deficit of 32 TAF in those years. These occurrences resulted due to insufficient baseline SWP exports in July, August, and September to provide for recovery of storage in Oroville, and likely could have been avoided with more real-time operations input and more selective criteria for approving pulse flows.

Chino Basin storage maximized at 150 TAF in nine of the 81 years resulting in a total of 65 TAF of AWPF spill of the total 1,215 TAF production, or about five percent spill. Review of the annual operations reveals that the sequence of hydrologic years in the CalSim operations includes more frequent dry years in the first part of the 81-year sequence and less frequent dry years in the second part of the 81-year sequence. This results in more consistent use of Chino Basin storage in the first part of the simulation, but a ten-year sequence of years in the mid part of the simulation when few

pulse flows are triggered and Chino Basin storage reaches maximum levels. If this hydrologic sequence of years were to occur in real-time operations, adaptive management would likely be necessary to repurpose the CBP WSIP exchange supplies. Baseline and reoperated storage in Lake Oroville and San Luis Reservoir over the 81-year simulation are illustrated in Figure 1. Metropolitan reoperations and status of CBP WSIP virtual storage accounts over the 81-year simulation are illustrated in Figure 2.

Under the simulated operations, the Chino Basin to Metropolitan exchange supplies consisted of 90 percent in lieu deliveries and ten percent pump-in deliveries. Because the Metropolitan to SWP and Chino Basin to Metropolitan performance requirements were delinked, a total of 967 TAF were provided to Metropolitan from the Chino Basin while SP deliveries to Metropolitan were reduced by 920 TAF. The resulting net surplus Chino Basin to Metropolitan deliveries of 57 TAF over the 81-year simulation could be managed in real-time operations to ensure balanced performance. The largest surplus over the 81 years was 137 TAF while the largest deficit was 167 TAF. These relatively large amounts indicate that operational requirements may need to be implemented in a future exchange agreement to limit exposure to maximum surplus and deficits for both IEUA and Metropolitan.

Importantly, this operations analysis demonstrates that the delinked performance requirements allow Metropolitan some conjunctive use benefits through implementation of the CBP WSIP water exchange. Figure 3 illustrates an annual summary of the results of CBP WSIP Metropolitan reoperations. As shown by the relative positions of the blue diamond markers indicating baseline SWP deliveries and the green vertical bars representing reoperated SWP deliveries, CBP WSIP reoperations result in additional total deliveries to Metropolitan in the most critically dry years of the 81-year sequence, while the balancing decrease in deliveries occurs in wetter years. This contribution to regional water supply reliability could likely be further optimized in real-time operations.

Conclusions

The CBP WSIP Ops Model was developed to demonstrate proof of concept for the proposed CBP WSIP water exchange, aid in developing protocols to reduce risk to other SWP objectives, and inform more in-depth consideration of potential operating rules and procedures by DWR and project participants. The operations analysis summarized in this memorandum indicates that the proposed CBP WSIP water exchange can be implemented with relatively simple operational rules in place with minimal risk to other SWP objectives. While the simulated operations did result in an inability to refill Lake Oroville in some years, better use of situational and forecast input data in real-time operations could mitigate this risk and pulse flows could safely be implemented in other years to fulfill IEUA's CBP WSIP commitment for a total pulse flow volume of a 25-year term.

By delinking Metropolitan to SWP and Chino Basin to Metropolitan exchange performance requirements, conjunctive use benefits could accrue to Metropolitan and contribute to improved water supply reliability in the southern California region when SWP imported supplies are most limited. Moreover, the successful implementation of the CBP could lead to consideration of expanded use of the Chino Basin for groundwater storage and conjunctive use operations.

The logic incorporated in the CBP WSIP Ops Model is for demonstration purposes only and provides a conservative approach to protecting SWP operations. DWR has reviewed IEUA's work in developing possible approaches to implementing WSIP exchanges and is actively developing its own protocols, incorporating some of the principles developed for this effort. DWR's protocols are expected to include forecasting methods currently used in SWP Table A allocation determinations to ensure a low level of risk to other SWP objectives. Ultimately, specific procedures will be

institutionalized in operations agreements among DWR, the California Department of Fish and Wildlife, Metropolitan, and IEUA.

Table 1 CBP WSIP Ops Model General Input Assumptions

Input#	Assumption Description	Value	Notes
1.0 IEUA WSIP Program Environmental Exchange Assumptions			
1.1	Implement WSIP Exchange	TRUE	Use FALSE for Banking Only operations - **AUTO SELECTION**
1.2	Pulse Flow Volume in Call Years	50 TAF	Total volume released from Lake Oroville in Call Years as pulse flow
1.3	WSIP Program Term (Years)	25	Term of Commitment for WSIP Exchange
1.4	Total Number of Call Years over Program Term	7.5	Assumed number of Call Years based on commitments to CWC
1.5	Assumed Carriage Water Savings	20%	Carriage water savings to SWP due to export reduction allocated to IEUA
1.6	**Pulse Flow Assumptions**		Default is for Pulse Flows to occur in Critical and Dry Years if SWP conditions allow
1.6.1	Pulse Flow Month (March, April, or May)	April	Assumed Month of Call for Pulse Flow Release
1.6.2	Pulse Flow Trigger Type	Year Type	Base Pulse Flow Call Years on SWP allocations or Year Type
1.6.3	SWP Allocation Limits for Pulse Flow (For SWP Allocation Trigger Type Option - See 1.6.2)		SWP Allocation limits for Pulse Flow in Pulse Flow month
1.6.3.1	Minimum SWP Allocation for Pulse Flow	25%	Minimum SWP Allocation for Pulse Flow, subject to other restrictions
1.6.3.2	Maximum SWP Allocation for Pulse Flow	55%	Maximum SWP Allocation for Pulse Flow, subject to other restrictions
1.6.4	Year Type Limits for Pulse Flow (For Year Type Trigger Type Option - See 1.6.2)		
1.6.4.1	Restrict Pulse Flows in Critical Years	TRUE	Restrict pulse flows in all critical years regardless of other conditions
1.6.4.2	Allow Pulse Flows in Below Normal Years	TRUE	Allow Pulse flows in Below Normal Years if other conditions allow
1.6.4.3	Allow Pulse Flow in BN Year with High Chino Basin Account	TRUE	Allow Pulse Flows in Below Normal Years if Chino Basin Account is flagged as high and other conditions allow
1.6.5	Allow Pulse Flow in Any Year with High Chino Basin Account	FALSE	Allow Pulse Flow in any year type if Chino Basin Account is flagged as high and other conditions allow

Input#	Assumption Description	Value	Notes
1.6.6	Maximum Frequency of Annual Pulse Flows	3 Consecutive or 4 of 10 Yrs	Disallow Pulse Flow in any year if running frequency is exceeded
2.0 IEUA WSIP Facility Assumptions			
2.1	Total Annual AWPF Production and PUT Capacity	15.0 TAFY	Total AWPF production and PUT assigned to WSIP program
2.2	Total Annual Extraction Capacity	40.0 TAFY	Total physical groundwater extraction (TAKE) capacity - **BASED ON TAKE ALTERNATIVE**
2.3	Maximum Storage in Chino Basin Account	150 TAF	Maximum Chino Basin groundwater storage capacity allocated to program
2.4	Assumed Initial Storage in Chino Basin Account	75 TAF	Assumed initial storage for modeling purposes
2.5	Maximum Borrowing from Chino Basin Account	100 TAF	Maximum permitted borrowing of Chino Basin groundwater (no borrowing for MWD Predelivery)
3.0 IEUA WSIP - MWD Exchange Parameters			
3.1	**IEUA - MWD Exchange Criteria**		
3.1.1	Delink MWD SWP Reduction and IEUA Payback Performance Periods	TRUE	If true, reduced deliveries to MWD carried out under an independent time frame from IEUA payback
3.1.2	IEUA Payback Criteria Type	SWP Allocation	If performance delinked, select criteria type for IEUA performance
3.1.3	IEUA Payback Criteria for Year Type Trigger	Dry & Critical	If performance delinked and Year Type criteria type option, select year types for IEUA performance
3.1.4	IEUA Payback Criteria for Allocation Trigger	42%	If performance delinked and SWP Allocation criteria type option, select maximum SWP allocation for IEUA performance
3.2	**MWD Pump Delivery Back Assumptions**		
3.2.1	MWD Annual Predelivery Quantity (all years)	-	Annual quantity extracted from Chino Basin and predelivered to MWD - **BASED ON TAKE ALTERNATIVE**
3.2.2	Maximum Account of MWD Annual Predelivery	50 TAF	Maximum amount of predelivered to MWD on account
3.2.3	Assumed Initial Storage in MWD Predelivery Account	25 TAF	Assumed initial MWD predelivery water on account for modeling purposes

Input#	Assumption Description	Value	Notes
3.3	**IEUA In Lieu Delivery Assumptions**		
3.3.1	Volume of IEUA In Lieu Deliveries in SWP Call Years	30.0 TAFY	Total IEUA In Lieu Deliveries in Call Years
3.3.2	Volume of IEUA In Lieu Deliveries in Non SWP Call Years	40.0 TAFY	Total IEUA In Lieu Deliveries in MWD Call Years that are not SWP Call Years (Performance Periods Delinked)
3.3.3	Use Seasonal Monthly Demand Pattern for IEUA In Lieu Delivery	FALSE	Use seasonal or flat monthly demand patterns for deliveries (Note: Seasonal use is restricted for some take alternatives)
3.4	**Local Storage and other Local Agency In Lieu Delivery Assumptions**		
3.4.1	Maximum Storage in Auxiliary Local Storage Account	-	Local auxiliary storage used to store exchange water when extraction capacity is available
3.4.2	Assumed Initial Storage in Auxiliary Local Storage Account	-	Assumed initial storage for modeling purposes
3.4.3	Other Local Agency In Lieu Deliveries in Call Years	-	Maximum annual in lieu delivery to other local agencies from exchange water stored in auxiliary local storage
3.4.4	Use Seasonal Monthly Demand Pattern for Other Local Agency In Lieu Delivery	FALSE	Use seasonal or flat monthly demand patterns for deliveries
4.0 SWP Operations Limits			
4.1	Minimum Oroville Storage to allow Pulse Flow and Exchange (0 to 3,538 TAF)	1,500 TAF	Minimum Oroville storage for Pulse Flow to be allowed
4.2	Maximum Oroville Storage to allow Pre-delivery to Oroville (0 to 3,538 TAF)	2,500 TAF	Maximum Oroville storage for Predelivery to Oroville to be allowed
4.3	Maximum Predelivery to Oroville Storage (TAF):	-	Maximum volume to be stored as pulse flow predelivery in Oroville
4.4	Minimum Banks Pumping Limit for San Luis to	750 CFS	Minimum Banks PP export for HH&S - No reduction for Oroville refill below this amount

Input#	Assumption Description	Value	Notes
	Oroville Exchange (0 to 1,000 CFS)		
4.5	Minimum San Luis Storage to allow Pulse Flow	300 TAF	Minimum San Luis storage for Pulse Flow to be allowed (avoid dead pool)
4.6	Maximum San Luis Storage to allow Pulse Flow	1,068 TAF	Maximum San Luis storage for Pulse Flow to be allowed (avoid spill)
4.7	Maximum San Luis Storage Account Deficit Prior to Pulse Flow to Trigger Exchange	-25.0 TAF	Maximum San Luis storage deficit relative to baseline for Pulse Flow to be allowed
5.0 SWP - MWD Exchange Parameters			
5.1	Target Time Period for Completion of SWP Delivery Reductions	End of Calendar Yr	Target period of time for SWP reduced deliveries to MWD to complete SWP-MWD Exchange
5.2	Limit MWD Direct Exchange to Monthly SWP Delivery	TRUE	Limit rate of MWD-SWP exchange to baseline SWP delivery amounts (Only applies if 3.1.1 is FALSE)
5.3	Assumed Limiting SWP Baseline Deliveries	EB Table A	Select limiting deliveries form East/West CA Aqueduct Branches and Table A/all SWP deliveries
5.4	Defer MWD SWP Deliveries if San Luis at Dead Pool	TRUE	Force MWD reoperation if San Luis is at Dead Pool
6.0 Baseline Hydrology and SWP Operations Date Set			
6.1	Baseline Data Set (Historic 2008 - 2018 or CALSIM 2030, 2070, 2070_DEW, 2070_WMW):	CALSIM 2021 Update	Baseline operations data set - historical data or CalSim data sets with various climate change assumptions
7.0 Supplemental Water Banking Assumptions			
7.1	**AWT Banking Assumptions**		
7.1.1	Implement AWT Banking	FALSE	If TRUE is selected, carriage water savings during WSIP and all AWT Post-WSIP is banked - **AUTO SELECTION**
7.2	**Supplemental Imported Supply Banking Assumptions**		

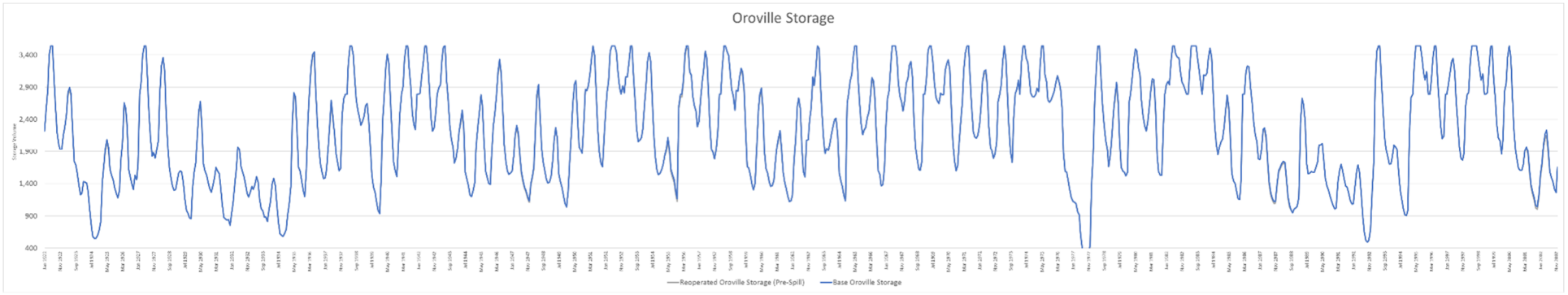
Input#	Assumption Description	Value	Notes
7.2.1	**General Supplemental Imported Supply (IS) Banking Assumptions**		
7.2.1.1	Implement Supplemental Imported Supply Banking	FALSE	Allow supplemental imported supply banking; Set to TRUE if IS Take Capacity > 0 - **AUTO SELECTION**
7.2.1.2	Maximum Allocated Storage for Imported Supply Banking	150 TAFY	Maximum groundwater storage capacity allocated to supplemental imported supply banking
7.2.1.3	Initial Storage in Imported Supply Bank	75 TAFY	Assumed initial storage for modeling purposes
7.2.2	**PUT Supplemental Imported Supply Banking Assumptions**		
7.2.2.1	Maximum Annual Put Capacity	-	Maximum annual groundwater recharge capacity (PUT) for supplemental imported supply banking - **AUTO SELECTION**
7.2.2.2	Trigger for Supplemental Imported Supply PUT year	Year Type	Select SWP Allocation or Year Type to trigger PUT year
7.2.2.3	SWP Table A Allocation Threshold for Banking PUT Trigger	65%	Select minimum annual SWP Table A allocation to trigger supplemental imported supply PUT
7.2.2.4	Year Types Threshold to Trigger PUT	Wet & Above Normal	Select Year Types to trigger supplemental imported supply put (Wet or Wet and Above Normal)
7.2.2.5	PUT Months for Supplemental Imported Supply Banking	Jan-Dec	Select seasonal or year-round PUT time period
7.2.3	**TAKE Banking Assumptions**		Assume AWT and Imported Supply Banking Programs share common take facilities
7.2.3.1	Maximum Annual Take Capacity	40.0 TAFY	Maximum Physical Take Capacity of Alternative. Available for IS Banking as 2nd Priority **- AUTO SELECTION**
7.2.3.2	Trigger for Banking TAKE year	Year Type	Select SWP Allocation or Year Type to trigger TAKE year
7.2.3.3	SWP Table A Allocation Threshold for Banking TAKE Trigger	50%	Select maximum annual SWP Table A allocation to trigger supplemental imported supply TAKE
7.2.3.4	Year Types Threshold to Trigger TAKE	Dry & Critical	Select Year Types to trigger supplemental imported supply Take (Crit, Dry & Crit, or BN, Dry & Critical)
7.2.3.5	TAKE Months for Banking	Jan-Dec	Select seasonal or year-round TAKE time period

Table 2 CBP WSIP Ops Model Summary Outputs

Exchange Operations Summary	
Take/Delivery Scenario Alternative:	**Take_9-3|WE-NB-IS00**
Take Alternative/Scenario	Take_9-3
WSIP Exchange	TRUE
AWT Banking	FALSE
Imported Supply Banking Put Capacity	0
Baseline Operations Dataset	CALSIM 2021 Update
Delink MWD SWP Reduction and IEUA Payback Performance Periods	TRUE
IEUA Payback Criteria Type	SWP Allocation
Payback Trigger	0.42
Total Critical Years:	12
Total Dry Years:	18
Total Normal Years:	14
Total Above Normal or Wet Years:	37
Total Number of Pulse Flow Exchanges:	23
Total Pulse Flow Volume (TAF):	1150.0
Number of Pulse Flow Exchanges in Critical Years:	0
Number of Pulse Flow Exchanges in Dry Years:	13
Number of Pulse Flow Exchanges in Below Normal Years:	10
Number of Pulse Flow Exchanges in Above Normal or Wet Year:	0
Percentage of Years of Pulse Flow Exchanges:	28%
Total Pulse Flow Volume Surplus Compared to Target (TAF):	-65.0
Number of Critical Years Oroville Storage Deficit Extends Beyond Pulse Flow Water Year:	1
Number of Dry Years Oroville Storage Deficit Extends Beyond Pulse Flow Water Year:	1
Total Number of Years Oroville Storage Deficit Extends Beyond Pulse Flow Water Year:	4
Average Annual Oroville Storage Deficit for Years of Occurrence (TAF):	-32.0
Total Amount Predelivered to Oroville (TAF)	0.0
Total Predelivered Water Used for Pulse Flows (TAF)	0.0
Total Predelivered Water Spilled from Oroville (TAF)	0.0
Final Oroville Predelivery Storage (TAF)	0.0
Percentage of Total Predelivered Water used for Pulse Flows:	#N/A
Percentage of Total Predelivered Water Spilled from Oroville:	#N/A
Percantage of Total Predelivered Water left in Storage:	#N/A
Maximum Chino Basin Storage (TAF):	150.0
Minimum Chino Basin Storage (TAF):	-63.3

Exchange Operations Summary	
Total Chino Basin AWT Production (TAF):	1215.0
Chino Basin AWT Production for Exchange (TAF):	972.0
Excess Chino Basin AWT Production (TAF):	64.7
Final Chino Basin Storage (TAF):	5.7
Maximum Predelivery to MWD on Account (TAF):	0.0
Minimum Predelivery to MWD on Account (TAF):	0.0
Final MWD Predelivery Account (TAF):	0.0
Maximum Decrease in San Luis Res Storage (TAF):	0.0
Maximum Increase in San Luis Res Storage (TAF):	0.0
Minimum San Luis Res Storage (TAF):	55.0
Number of Years San Luis Reservoir below 55 TAF:	0
Total IEUA In Lieu Deliveries (TAF)	876.7
Total Other Local Agency In Lieu Deliveries (TAF)	0.0
Total Predelivery to MWD (Used for Exchange) (TAF)	0.0
Total Pump-In to MWD in Call Years (TAF)	100.0
Total Chino Basin Exchange with MWD (TAF)	976.7
Total SWP Delivery Reductions to MWD (TAF):	920.0
Surplus/Deficit CB Payback to MWD (TAF)	56.7
Percentage of Exchange from IEUA In Lieu Deliveries:	90%
Percentage of Exchange from other local agency In Lieu Deliveries:	0%
Percentage of Exchange from Predelivery to MWD:	0%
Percentage of Exchange from Pump-In to MWD:	10%
Percentage Surplus CB Payback/Total CB Payback	6%

Figure 1 Lake Oroville and San Luis Reservoir Storage Reoperations



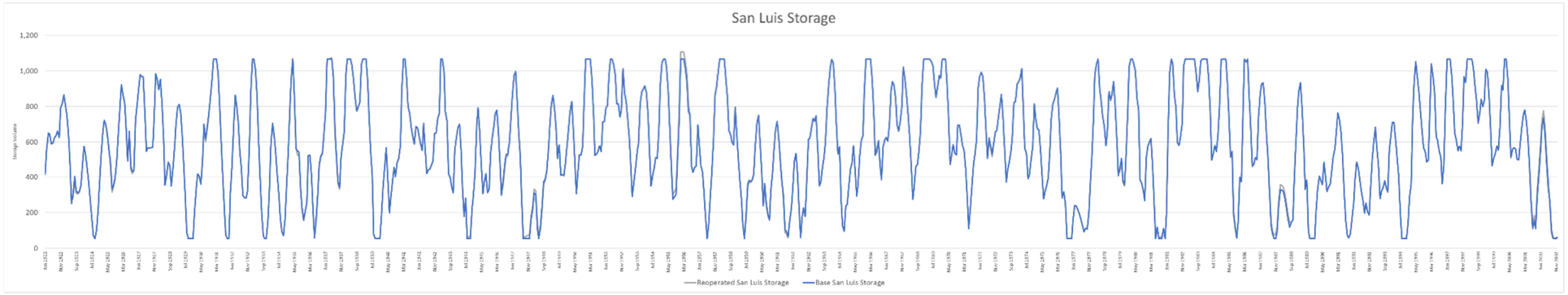


Figure 2 Metropolitan Delivery Reoperations and CBP Operations Storage Accounts

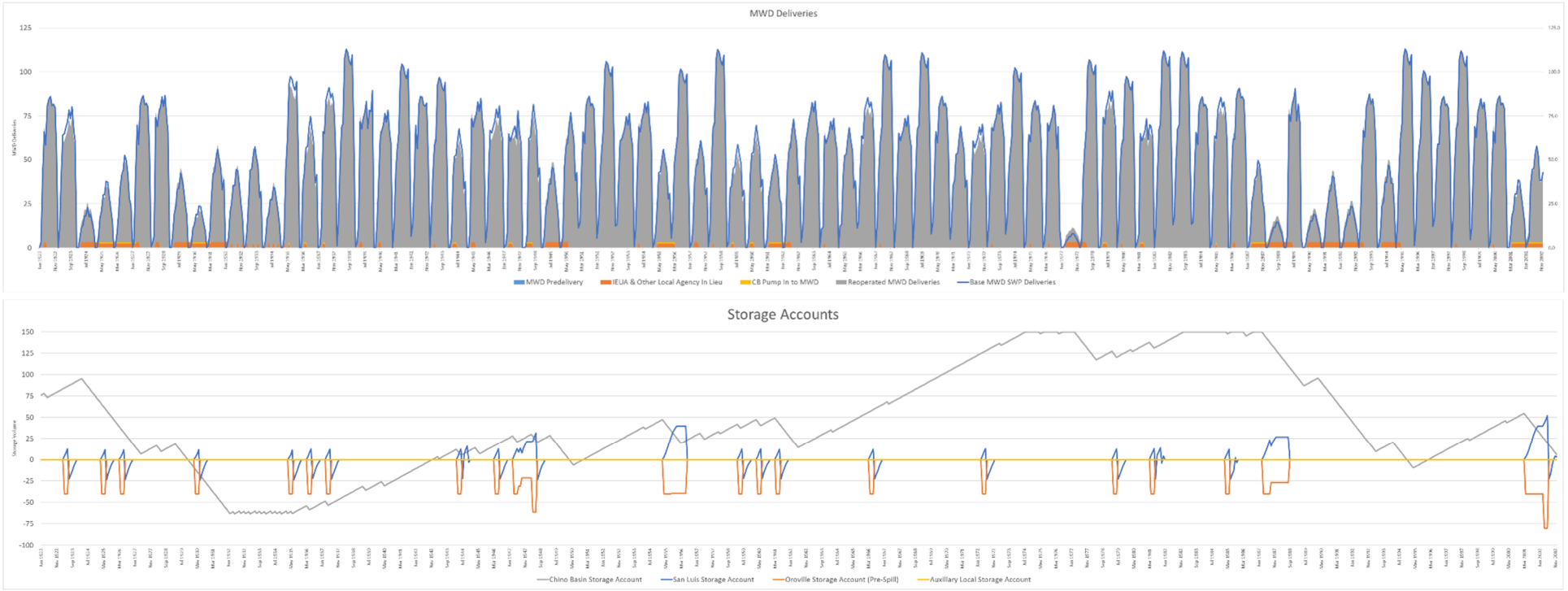


Figure 3 CBP WSIP Reoperations for Metropolitan